Topic: Finding sine and cosine of an angle theta

Question: In which subinterval does the angle lie?

In which of the following subintervals of the interval $(0,2\pi)$ does the measure (in radians) of an angle θ lie if $\sin\theta = -0.762$ and $\cos\theta = -0.647577$?

Answer choices:

A $\theta \in \left(0,\frac{\pi}{2}\right)$

B $\theta \in \left(\frac{\pi}{2},\pi\right)$

C $\theta \in \left(\pi,\frac{3\pi}{2}\right)$

D $\theta \in \left(\frac{3\pi}{2},2\pi\right)$

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Solution: C

Note that $\sin\theta$ and $\cos\theta$ are both negative. Also, recall that the values of $\sin\theta$ and $\cos\theta$ are equal to the y- and x-coordinates, respectively, of the point P at which the terminal side of θ intersects the unit circle. Therefore, the y- and x-coordinates of P are both negative.

Any point whose y- and x-coordinates are both negative is located in the third quadrant, which means that the terminal side of θ lies in the third quadrant. Therefore, the measure (in radians) of θ lies in the subinterval $(\pi,3\pi/2)$ of the interval $(0,2\pi)$.

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Topic: Finding sine and cosine of an angle theta

Question: Which of the following statements is true?

Answer choices:

A $\sin(-340°)$ and $\cos(-340°)$ are both positive

B $\sin(-340°)$ is positive, and $\cos(-340°)$ is negative

C $\sin(-340°)$ is negative, and $\cos(-340°)$ is positive

D $\sin(-340°)$ and $\cos(-340°)$ are both negative

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Solution: A

For any angle θ, the values of $\sin(\theta)$ and $\cos(\theta)$ are equal to the y- and x-coordinates, respectively, of the point P at which the terminal side of θ intersects the unit circle. Note that the terminal side of an angle of -340° lies in the first quadrant.

Since the y- and x-coordinates of any point in the first quadrant are both positive, we see that $\sin(-340^\circ)$ and $\cos(-340^\circ)$ are both positive.

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Topic: Finding sine and cosine of an angle theta

Question: Which of the following is true about the angle?

$$\theta = \frac{15\pi}{8} \text{ radians}$$

Answer choices:

A $\sin(\theta) \approx -0.56$ and $\cos(\theta) \approx 0.83$

B $\sin(\theta) \approx -0.38$ and $\cos(\theta) \approx 0.92$

C $\sin(\theta) \approx -0.47$ and $\cos(\theta) \approx 0.88$

D $\sin(\theta) \approx -0.25$ and $\cos(\theta) \approx 0.97$

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Solution: B

We'll sketch the sides of an angle of $15\pi/8$ radians. First, note that

$$\frac{3\pi}{2} = \frac{12\pi}{8} < \frac{15\pi}{8} < \frac{16\pi}{8} = 2\pi$$

Therefore, the terminal side of θ lies in the fourth quadrant. Also,

$$\frac{3\pi}{2} - \frac{12\pi}{8} = \frac{12\pi}{8} - \frac{12\pi}{8} < \frac{15\pi}{8} - \frac{12\pi}{8} < \frac{16\pi}{8} - \frac{12\pi}{8} = 2\pi - \frac{12\pi}{8}$$

Thus

$$\frac{3\pi}{2} - \frac{12\pi}{8} = 0 < \frac{3\pi}{8} < \frac{4\pi}{8} = 2\pi - \frac{12\pi}{8}$$

That is, in terms of angle measure, the terminal side of an angle of $15\pi/8$ radians is located $3/4$ of the way from the terminal side of an angle of $3\pi/2$ radians to the terminal side of an angle of 2π radians.

On the same set of coordinate axes, we'll graph the unit circle and then determine the values of the x- and y-coordinates of the point P where that circle intersects the terminal side of an angle of $15\pi/8$ radians.

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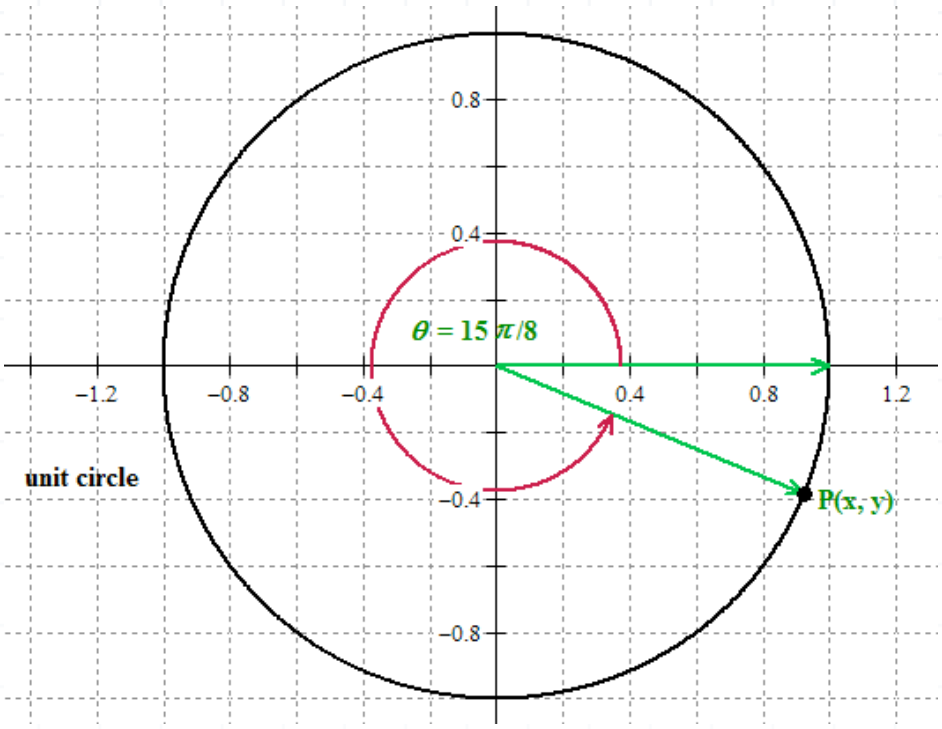

According to the graph, $0.9 < x < 1$ and $-0.4 < y < -0.3$. Since

$$\sin\frac{15\pi}{8} = y$$

and

$$\cos\frac{15\pi}{8} = x$$

we find that the correct answer is B.

$$\sin\frac{15\pi}{8} \approx -0.38 \text{ and } \cos\frac{15\pi}{8} \approx 0.92$$

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